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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/912,103	07/23/2001	Huong Thanh Nguyen	5619/DD/LOW K/JW	4476
32588	7590	03/31/2005	EXAMINER	
APPLIED MATERIALS, INC. 2881 SCOTT BLVD. M/S 2061 SANTA CLARA, CA 95050			NGUYEN, KHIEM D	
			ART UNIT	PAPER NUMBER
			2823	

DATE MAILED: 03/31/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

AK

Office Action Summary	Application No.	Applicant(s)	
	09/912,103	NGUYEN ET AL.	
	Examiner	Art Unit	
	Khiem D. Nguyen	2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 06 January 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-24 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 July 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Applicant's request for reconsideration of the Advisory Action mailed on February 3rd, 2005 Paper No. 012505 is persuasive and, therefore, that Advisory Action is withdrawn.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-24 are rejected under 35 U.S.C. 102(e) as being anticipated by Jiang et al. (U.S. Pub. 2002/0031906).

In re claim 1, Jiang discloses a method of fabricating a damascene structure, comprising: (a) forming a barrier layer 104 on a substrate 100 having a metal layer 102 thereon (pages 2-3, paragraph [0019] and FIG. 2A);

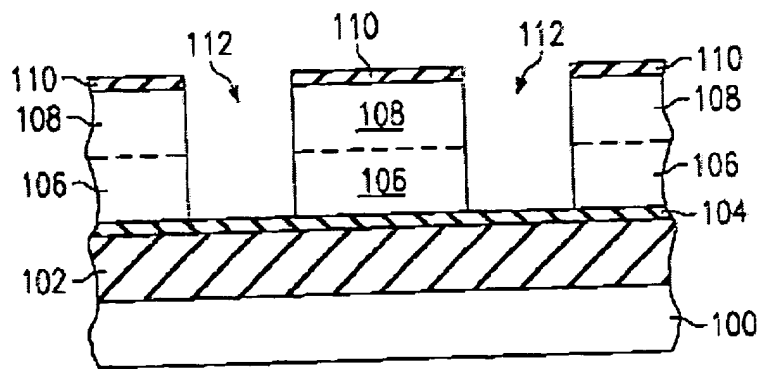


FIG. 2A

(b) forming a first organosilicate layer **106** on the barrier layer **104** (page 2, paragraph [0020] and FIG. 2A);

(c) forming a silicon oxide layer on the first organosilicate layer **106** (FIGS. 1A-2A);

(d) forming a second organosilicate layer **108** on the silicon oxide layer (page 2, paragraph [0020] and FIG. 2A); and

(e) etching the second organosilicate layer **108** to define vias **112**, **121** therein (page 2, page 2, paragraphs [0023]-[0027] and FIGS. 2C-D),

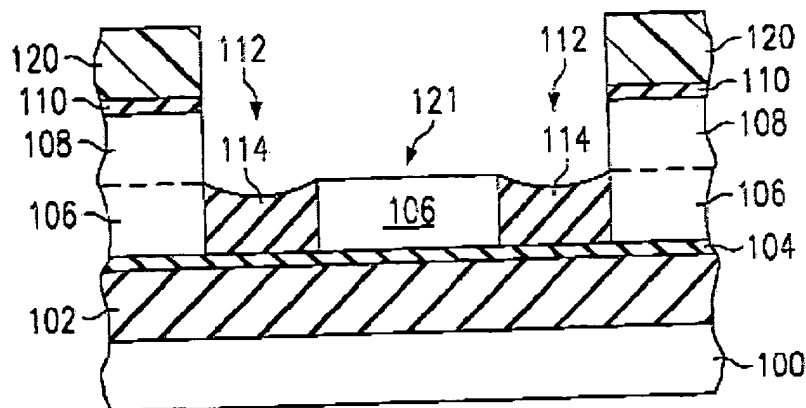


FIG. 2C

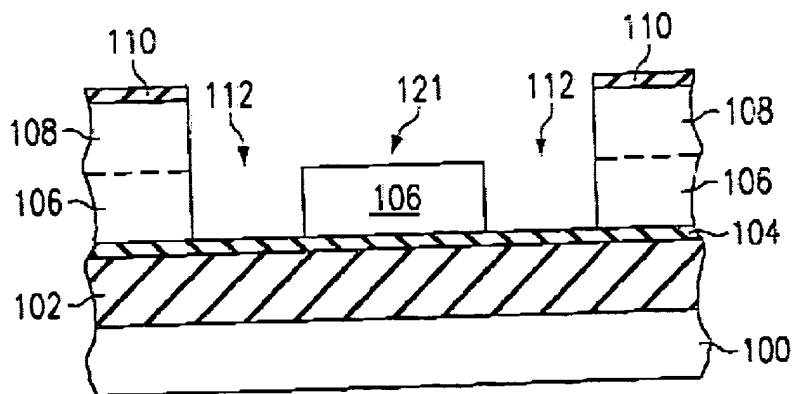


FIG. 2D

wherein the second organosilicate layer **108** is etched with a gas mixture comprising a hydrogen-containing fluorocarbon ($C_xH_yF_{22x+Z}$ ($Z \geq 0$, $Y \geq 0$)) and one or more gases selected from the group consisting of hydrogen (H_2), Nitrogen (N_2), oxygen (O_2), argon (Ar), and helium (He) (page 2, paragraph [0027]).

In re claim 2, **Jiang** discloses that the method of claim 1, further comprising:

(f) etching the silicon oxide layer to transfer the vias **112**, **121** defined in the second organosilicate layer **108** therethrough (FIG. 2C);

(g) patterning the second organosilicate layer **108** to define interconnects therethrough, wherein the interconnects **121** are positioned over the vias **112**, and wherein the via pattern is transferred through the first organosilicate layer **106** when the interconnects are defined in the second organosilicate layer **108**; and

(g) filling the vias and interconnects **121** with a conductive material **122** (page 2, paragraph [0032] and FIGS. 2D-E).

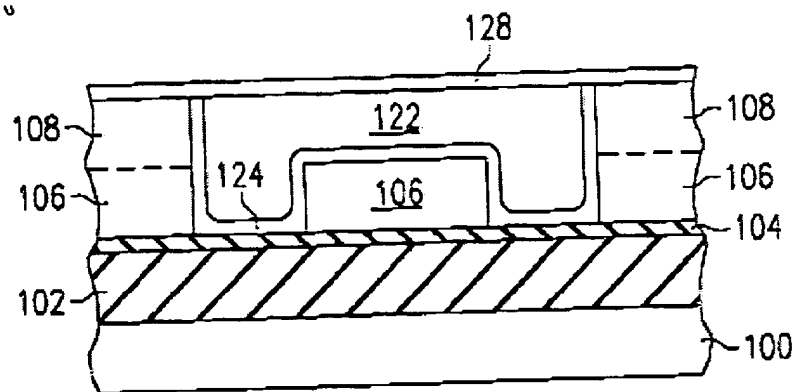


FIG. 2E

In re claim 3, **Jiang** discloses that the interconnects **121** are defined in the second organosilicate layer **108** and the vias **112** are defined in the first organosilicate layer **106** using a hydrogen-containing fluorocarbon gas mixture (page 2, paragraph [0027]).

In re claim 4, **Jiang** discloses that the conductive material **122** filling the vias **112** and interconnects **121** is selected from the group of copper (Cu), aluminum (Al), tungsten (W), and combinations thereof (page 2, paragraph [0032]).

In re claim 5, **Jiang** discloses that the gas mixture includes one or more gases selected from the group consisting of trifluoromethane (CHF_3), difluoromethane (CH_2F_2), and fluoromethane (CH_3F) (page 2, paragraph [0027]).

In re claim 6, **Jiang** discloses that the gas mixture further comprises a gas selected from the group consisting of carbon tetrafluoride (CF_4) and fluoroethane (C_2F_6), and combination thereof (page 2, paragraph [0027]).

In re claim 7, **Jiang** discloses that the gas mixture includes hydrogen (H_2) (page 2, paragraph [0027]).

In re claim 8, **Jiang** discloses that the second organosilicate layer is etched at a temperature within a range of about -20°C to about 80°C (page 2, paragraphs [0023]-[0026]).

In re claim 9, **Jiang** discloses that the second organosilicate layer **108** is etch at a pressure within a range of about 5 mtorr to about 1 torr (page 2, paragraphs [0023]-[0026]).

In re claim 10, **Jiang** discloses that the method of claim 1, further comprising applying an electric field to the hydrogen-containing fluorocarbon gas mixture (page 2, paragraphs [0023]-[0026]).

In re claim 11, **Jiang** discloses that the electric field is a radio frequency (RF) power (page 2, paragraphs [0023]-[0026]).

In re claim 12, **Jiang** discloses that the RF power is within a range of about 1 watt/cm² to about 100 watts/cm² (page 2, paragraphs [0023]-[0026]).

In re claim 13, **Jiang** discloses that the silicon oxide layer is etched with a fluorocarbon gas mixture (page 2, paragraphs [0023]-[0026]).

In re claim 14, **Jiang** discloses that the fluorocarbon gas mixture further comprises a gas selected from the group consisting of carbon tetrafluoride (CF₄) and fluoroethane (C₂F₆), and combination thereof (page 2, paragraph [0027]).

In re claim 15, **Jiang** discloses that the fluorocarbon gas mixture further includes one or more gases selected from the group consisting of hydrogen (H₂), nitrogen (N₂), oxygen (O₂), argon (Ar), and helium (He) (page 2, paragraph [0027]).

In re claim 16, **Jiang** discloses that the silicon oxide layer is etched at a temperature within a range of about -20°C to about 80°C (page 2, paragraphs [0023]-[0026]).

In re claim 17, **Jiang** discloses that the silicon oxide layer is etch at a pressure within a range of about 5 mtorr to about 1 torr (page 2, paragraphs [0023]-[0026]).

In re claim 18, **Jiang** discloses that the method of claim 1, further comprising applying an electric field to the hydrogen-containing fluorocarbon gas mixture (page 2, paragraphs [0023]-[0026]).

In re claim 19, **Jiang** discloses that the electric field is generated using a radio frequency (RF) power (page 2, paragraphs [0023]-[0026]).

In re claim 20, **Jiang** discloses that the RF power is within a range of about 1 watt/cm² to about 100 watts/cm² (page 2, paragraphs [0023]-[0026]).

In re claim 21, **Jiang** discloses a method for fabricating a damascene structure, comprising: (a) forming a barrier layer **104** on a substrate **100** having a metal layer **102** thereon (pages 2-3, paragraph [0019] and FIG. 2A);

(b) forming a first organosilicate layer **106** on the barrier layer **104** (page 2, paragraph [0020] and FIG. 2A);

(c) forming a silicon oxide layer on the first organosilicate layer **106** (FIGS. 1A-2A);

(d) forming a second organosilicate layer **108** on the silicon oxide layer (page 2, paragraph [0020] and FIG. 2A); and

(e) etching the second organosilicate layer **108** to define vias **112**, **121** therein (page 2, page 2, paragraphs [0023]-[0027] and FIGS. 2C-D), wherein the second organosilicate layer **108** is etched with a gas mixture comprising one or more hydrogen-containing fluorocarbon gases ($C_xH_yF_{22x+Z}$ ($Z \geq 0$, $Y \geq 0$)) and one or more gasses selected from the group consisting of hydrogen (H_2), Nitrogen (N_2), oxygen (O_2), argon (Ar), and helium (He) (page 2, paragraph [0027]); and

(f) etching the silicon oxide layer **106** to transfer the vias **112, 121** defined in the second organosilicate layer **108** therethrough (FIG. 2C), wherein the silicon oxide layer is etched with a gas mixture comprising a fluorocarbon gas (page 2, paragraphs [0023]-[0027]).

In re claim 22, **Jiang** discloses that the gas mixture for etching the second organosilicate layer **108** comprises hydrogen (H_2) (page 2, paragraph [0027]).

In re claim 23, **Jiang** discloses that the gas mixture for etching the second organosilicate layer **108** comprises trifluoromethane (CHF_3), dimethylfluoride, and hydrogen (page 2, paragraph [0027]).

In re claim 24, **Jiang** discloses that the gas mixture for etching the second organosilicate layer **108** comprises difluoromethane, tetrafluoride, and hydrogen (page 2, paragraph [0027]).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Khiem D. Nguyen whose telephone number is (571) 272-1865. The examiner can normally be reached on Monday-Friday (8:30 AM - 5:30 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on (571) 272-1855. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Art Unit: 2823

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

K.N.
March 25, 2005



**W. DAVID COLEMAN
PRIMARY EXAMINER**